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# Common Information Sharing on Maritime Domain

## *A Qualitative Study on European Maritime Authorities' Cooperation*

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**Keywords:** Information Sharing, Authorities' Interaction, Cooperation, Maritime Surveillance, Maritime Safety, Common Information Sharing Environment.

**Abstract:** The most important element of the Common Information Sharing Environment (CISE) is to allow the data collected by the maritime authority to be available for specific purposes by the other maritime authorities. Different actors collect data on a number of occasions and CISE allows for cross-border and cross-sector information exchange. Compliance with the European Maritime Security Strategy and CISE model maximises interoperability with other already existing and functioning Maritime Safety Authorities' (MSA) entities. This qualitative study brings out European Union projects FiNCISE, EUCISE and MARISA together with authorities' cooperation in maritime domain. A response to security challenges and improving safety requires the cooperation of all administrative sectors, other actors, and close interaction. The action of authorities needs to be more strongly aimed at common goals. Authorities will contribute to a stronger position to act together culture and a strong commitment to common goals. The challenges are not solvable by a single administrative sector or a single actor alone posed by the complex global environment. Cooperation insist deep and committed cooperation between the authorities and other actors.

## 1 INTRODUCTION

EU's Integrated Maritime Policy (IMP) focus on issues that are common for cross-sector and/or cross-border. These crosscutting policies are; Blue Growth, marine data and knowledge, maritime spatial planning, integrated maritime surveillance, and sea basin strategies. IMP is a framework with objectives to maximise the sustainable use of seas and oceans with intention to increase maritime and coastal region's growth, to build a knowledge and innovation base for maritime policy, to improve quality of life in coastal areas, to promote EU leadership in international maritime affairs, to raise a visibility of European maritime, and to create international coordinating structures for maritime affairs and to define responsibilities and competencies of coastal areas (European Commission, 2017).

On 2005 the European Commission forwarded a Communication on an Integrated Maritime Policy for setting planned objectives for a Green Paper. On 2006 a Green Paper "A Future Maritime Policy for the Union: a European Vision of the Oceans and Seas" was published (Commission of the European Communities, 2006). Commission of the European

Communities communication COM(2007) 575 was a proposal for IMP: "An integrated Maritime Policy for the European Union". This communication is known as the Blue Paper and it gives outlines for an Integration of Maritime Surveillance for enhanced and coherent sharing of information. The European Commission published on 2010 a Communication "A Draft Roadmap towards establishing the Common Information Sharing Environment for the surveillance of the EU maritime domain" (European Commission, 2010a). The objective of the IMP is to "foster coordinated and coherent decision-making to maximise the sustainable development, economic growth and social cohesion of the Member States, in particular with regard to coastal, insular and outermost regions in the Union, as well as maritime sectors, through coherent maritime-related policies and relevant international cooperation" (European Parliament, 2011).

The study concentrates on European Maritime Authorities' cooperation on surveillance and information sharing cross-border and cross-sector. Due to the fact that numerous systems are not yet interconnected and operate simultaneously, the authorities shall contribute to a stronger position to

act together culture and a strong commitment to common goals. The research question of this study is: How to respond to security challenges and improve cooperation and interaction between different administrative sectors?

## 1.1 Structure of This Paper

The second chapter of this study concerns methodology used, the third chapter presents the factors affecting the European Union's maritime policy, and is divided into sections; CISE program, EUCISE-, FiNCISE- and MARISA projects and maritime security-related cooperation FIMAC organization. The fourth chapter discusses the findings of the study, and finally the fifth chapter includes a discussion and conclusions of the study.

## 2 METHODOLOGY

The research is qualitative in nature, and the purpose of the study is to find the entities to examine and to understand their meanings. The study is a qualitative study of the characteristic description of the real life (Hirsjärvi, Remes & Sajavaara, 2007). An inductive content analysis of results indicates the generalizations and conclusions drawn from the facts that emerge from the source material to show consistency (Alasuutari, 1995). Earlier knowledge and practical experiences raise the researcher's preconceptions and the assumed starting points for concept formation, although the researcher is ready to overcome it.

Dubé and Pare (2003) claim that "Case study research offers the opportunity to use many different sources of evidence". There are weaknesses and strengths in all case study sources and therefore, it is advisable to use several sources of evidence in a case study. The main asset of the case study is the ability to make different kinds of evidence sources to get more information about issues than any single method. (Yin, 2009.) The research material was acquired by participatory observing, scientific reports, collected articles, and literary review. The main sources of the research are the regulations of the EU's Integrated Maritime Policy, public material relating to EU projects, a public material of the Border Guard and theme related Valtonen's and Vuorisalo's dissertations. Participating and observing project meetings, workshops and discussions with other participants were beneficial source material. Observation in data collection method is used in conjunction with another method because it is

challenging to analyse the material obtained solely from observation. Observation is a method for verification of conflicts between the experimental data and the reality. (Tuomi & Sarajärvi, 2004; Järvinen & Järvinen, 2004). The observation as a method allows for the creation of an immediate relationship in the natural conditions to the observable objects. However, the presence of the observer may have an impact on the results, as observation may cause suspicion, resistance and abnormal behaviour among the group to be investigated. (Saaranen-Kauppinen & Puusniekka, 2009). The study was done as a qualitative study where the results are based on the researcher's inference (Huttunen & Metteri, 2008).

## 3 COMMON INFORMATION SHARING IN MARITIME DOMAIN

The main guiding factor for the Common Information Sharing Environment (CISE) mechanism is to permit that information collected for the specific purpose by a maritime authority is available to other maritime authorities. Information is collected multiple times by different actors and CISE allows cross-border and cross-sector information exchanges. (European Commission, 2014a).

### 3.1 CISE

Currently, there are seven maritime surveillance user communities, referred also as sectors: maritime safety, General Law enforcement, border control, customs, fisheries control, marine environment, and defence. EU-wide information exchange environment allows automatic and seamless information exchange among over 300 public maritime authorities at EU and national level (European Commission, 2010a). CISE Technology Advisory Group's (TAG) gap analysis in 2012 showed that only 30% of the collected and relevant data to other authorities is shared (European Commission, 2014b). However, aforementioned does not mean that there should be one common maritime picture, but that the authorities should have the opportunity to form the desired maritime picture for their purposes.

Test Project on cooperation in executing various maritime functionalities at sub-regional or sea-basin level in the field of integrated maritime surveillance (CoopP) was a test project that investigated needs,

barriers, benefits and technologies for information exchange. The CoopP project's aim was to enhance the development of CISE. CoopP had 31 partners from ten Member States, seven EU agencies and international organisations and approximately 40 maritime authorities involved in the project. CoopP project described three High- Level Use Cases 1) Baseline operations, 2) Targeted operations, and 3) Response operations. The baseline operations' purpose was to ensure the lawful, safe and secure performance of maritime activities. The aim of the targeted operations was to react to specific threats to sectoral responsibilities and to give support to operational decision making. The response operations' intent was to respond to events affecting several actors, cross-sector and cross-border. During the project was analysed nine Use Cases. Criteria for selected Use Cases was to ensure that selected cases cover all user communities. (Finnish Border Guard, 2014.)

Policy-oriented marine Environmental Research in the Southern European Seas (PERSEUS) was a four-year (2012 - 2015) European Union's Seventh Framework Programme (FP7) for research, technological development and demonstration. The project's aims were to develop and test European maritime surveillance system by integrating existing national and European level systems, and by upgrading and improving them and thereby supporting the creation of CISE. The PERSEUS Demonstration Project was implemented through live exercises in Spain, Portugal, France, Italy and Greece. Exercises showed that legacy systems can interoperate and the authorities of the Member States can cooperate seamlessly. (PERSEUS, 2015.)

### 3.2 EUCISE

A European test-bed for the Maritime Common Information Sharing Environment in the 2020 perspective (EUCISE 2020) project's general objective is to develop European maritime safety by building a common information sharing environment for the maritime surveillance. The project is coordinated by Agenzia Spaziale Italiana (ASI) with 40 partners from the European Union and European Economic Area (EEA). EUCISE 2020 combines existing control systems and networks and provides the authorities the necessary information on maritime surveillance. The objective is to allocate maritime information to all maritime sectors of the EU and the EEA in the future. EUCISE 2020 is based on voluntary cooperation between the authorities involved in the European maritime surveillance.

EUCISE 2020 is based on existing information exchange systems and does not replace them. The aim of the EUCISE project is to share the collected information with other maritime operators to the extent that several authorities collect and process the same information. (EUCISE, 2015a.)

Maritime tracking data, which will be shared within EUCISE 2020 project partners, include information such as vessel locations, routes, freight, maps, and weather and sea conditions. (EUCISE, 2015b.) The pilot project CoopP defined nine significant use cases. These use cases are used in the EUCISE 2020 project as they present several sectors of maritime authorities.

### 3.3 FIMAC

Finnish Maritime Authorities Cooperation (FIMAC) has its roots back in 1994 when the ministerial committee for administration development published a report on the rationalization of maritime functions. Cooperation parties are; Finnish Transport Agency, Finnish Transport Safety Agency, Finnish Border Guard and Finnish Navy. FIMAC's strategic goals are; increasing maritime safety, development of data management and information exchange, international influence, and joint use of capacity (FIMAC, 2014).

Co-operation promotes risk management and provides a common sense of awareness for maritime safety, which makes efficient and flexible use of public resources. The actors jointly utilize their experts, information obtained and research data from sea areas. The common information exchange environment is developed according to user needs. In international relations, FIMAC works actively and systematically to achieve common national goals. National co-operation will ensure effectiveness in issues important to Finland. Infrastructure, resources, expertise, and procurement coordination are increasingly utilized to improve efficiency and to minimize total costs. Since the cooperation foundation, authorities have saved funds over 50 million euros by investments on data transmission networks, sensors, and radio networks (FIMAC, 2014).

Cooperation today is routine co-operation, which automatically searches for common solutions that benefit both society and maritime safety. Finland has always had a desire for cooperation between the authorities (Luukkala, 2009). The need for cooperation between the authorities in Finland is due the limited resources of the public authorities and the convergence of the authorities' organizations, especially on knowledge management (Tuohimaa,

Tikanmäki & Rajamäki, 2011). Even though the tasks of the authorities are different, there is congruence in the various tasks required the necessary awareness. In addition, the tasks and resources of gathering information can be shared cost-effectively between the various public authorities.

### 3.4 FINCISE and National CISEs

Finnish National Common Information Sharing Environment for Maritime Surveillance (FiNCISE) is a European Union's European Maritime and Fisheries Fund (EMFF) programme. Duration of the project is two years from November 2015 to November 2017. The project consortium consists of Finnish Maritime Authorities Cooperation (FIMAC) that has as partners; Border Guard, Navy, Traffic Safety Agency and Traffic Agency. FiNCISE has also as a partner Finnish Environment Institute to test external services with other authorities. (FiNCISE, 2015.)

The aim of the FiNCISE project is to support the cooperation in the framework of FIMAC to create a maritime situational picture and distribute it to the cooperative parties to support their activities. Another goal of the project is to promote the well-functioning FIMAC operations model in national and international projects and forums and thus to improve maritime safety in the Baltic Sea. The technical objective of the FiNCISE project is to improve the interoperability of national maritime surveillance systems across sectors and across borders within the European Union. (FiNCISE, 2017.)

The focus is system-to-system information exchange. Specific objectives for FiNCISE project are to develop a national enterprise architecture description related production and to share National Maritime Surveillance Picture (NMSP), Maritime resource situation picture (MRSP), and other Maritime Situation Awareness (MSA) information. FiNCISE expects following operational benefits:

- More cost-efficient maritime surveillance and maritime operations;
- Improved data quality, description, system-to-system sharing architecture, and enhanced interoperability;
- Added value services and advanced understanding of the maritime situation in various sectors. (Laaksonen, 2017.)

FiNCISE will implement following technical solutions: 1) describe an enterprise architecture with processes, 2) define requirements for a national solution, 3) define a service channel to connect databases, 4) produce a description of the concept of interface solutions to system-to-system sharing, 5)

connects at least one concrete pilot-case from the legal system to another, both nationally and EUCISE interface, and, 6) study possibilities to use open source technology. (Laaksonen, 2017.)

In addition to FiNCISE, there are interoperability projects ongoing in other member states funded by European Maritime and Fisheries Fund (EMFF) and managed by the European Commission's European Agency for Small and Medium Enterprises (EASME). In Spain, Finland, Greece, Portugal, Romania, Bulgaria and Cyprus, a total of 10 ongoing projects are going on in the period from January 2016 to December 2018. The objective of these projects is to "foster the information exchange across sectors and borders by supporting the improvement of IT interoperability between national authorities' systems" (JRC, 2017).

### 3.5 MARISA

Maritime Integrated Surveillance Awareness (MARISA) project aims to provide a more informative and synthetic information on the design, development, improvement and testing of new functionalities, services and co-operation, and to improve the validity of available information for decision-making. Data fusions utilize information from a variety of sources of information, such as radar, infrared, camera, satellite, AIS, positioning system, social media, or observation system. In addition to the numerous sources of information from the authorities, social media is a mechanism for the communication of citizens by the public, where everyone has the ability to be an active observer and messenger, as well as a content provider in addition to receiving information. The objectives of the MARISA project are to: create an improved situation awareness, support maritime professionals throughout the life cycle, facilitate cooperation between adjacent and cross-border agencies and promote the dynamic ecosystem of users and service providers, and enable stakeholder enrichment of situation awareness by integrating their own knowledge by creating locally enriched status knowledge and sharing centralized awareness. (MARISA, 2017.)

Compliance with the European Maritime Security Strategy and CISE model maximises interoperability with other already existing and functioning MSA entities. The MARISA toolkit is designed to streamline integration with existing and future MSA operating systems to enable different configurations and recovery levels. This ensures full compatibility with the CISE and European policies, facilitating the

interagency interoperability and cooperation, and thereby allowing each Member State to decide when and whether or not additional sources of information are relevant to its operation. (MARISA, 2017.) MARISA enables Design Science Research Methodology (DSRM), user-centred methods for designing and implementing information systems. “MARISA therefore focuses on taking these benefits to the next level, while remaining completely integrated in the current European policy” as stated in MARISA Grant Agreement. (MARISA, 2017.)

MARISA project will benefit previous EU projects, such as CoopP and PERSEUS, operational scenarios referred to as use cases and their descriptions. Use cases and trials in MARISA project will use five use cases (UC) that are based on CoopP project. Use cases are: 1) UC 13b: Inquiry on a specific suspicious vessel (cargo related), 2) UC 37: Monitoring of all events at sea in order to create conditions for decision making on interventions, 3) UC 44: Request any information confirming the identification, position and activity of a vessel of interest, 4) UC 70: Suspect Fishing vessel/small boat is cooperating with other type of vessels (m/v, Container vessel etc.), and 5) UC 93: Detection and behaviour monitoring of IUU (Illegal, Unreported and Unregulated fishing) listed vessels. (MARISA, 2017.) Table 1 presents potential User Communities interested in Use Cases. Use cases will be exercised in five different areas as Operational Trials. Table 2 clarifies premeditated Operational Trial areas and use cases. These trials are exercised on North Sea, Iberian Sea, Strait of Bonifacio, Ionian Sea, and the Aegean Sea.

Table 1: User Communities and Use Cases (Adopted from MARISA, 2017).

	13b	37	44	70	93
Border Control	X	X	X		
Customs	X	X	X	X	
Defence	X	X	X	X	
General Law Enforcement	X	X	X	X	
Marine Environment	X	X	X		X
Fisheries Control		X	X	X	X
Maritime Safety		X	X	X	

Table 2: Operational Trials and Use Cases (Adopted from MARISA, 2017).

	13b	37	44	70	93
Northern Sea	X	X	X	X	X
Iberian Sea		X	X		
Strait of Bonifacio	X	X	X		
Ionian Sea	X	X	X	X	
Aegean Sea	X	X	X	X	

## 4 RESEARCH FINDINGS

Data from sensors of different authorities are combined, thereby enabling the analysis of information and, consequently, the most accurate maritime picture. The information obtained in the operating environment is necessary to form a comprehensive maritime picture. Operation environmental information needed is, such as geographic information, oceanography research data and weather conditions. The technique ensures the use of common information only for the desired organisations and the intended purpose. In connection with the introduction of technical solutions, a standardised approach will be implemented to ensure the exchange of information. (Vuorisalo, 2012.)

According to Vuorisalo (2012) identification of abnormal functions is hampered by:

- decision-makers lack sufficient and necessary information
- problems arising from the incompatibility of technical standards between systems
- lack of information due to the limited number of sensors
- customer orientation is attractive in business and sustainable solutions
- the excessive amount of information

The actors involved in the dissemination of information should prepare for the harmonization of information. By influencing political decision-making, favorable conditions for sharing information are created. Mutual benefit and interdependencies, as well as networking and its benefits in information sharing, must be understood. Such cooperation will facilitate the introduction of new technologies in the maritime community. (Vuorisalo, 2012.)

Interoperability plays an important role in collaborative multi-agency and multinational action. IEEE defines interoperability as “the ability of two or more systems to exchange data and to mutually understand the information which has been exchanged” (IEEE, 1990). Interoperability can be defined as the ability to communicate and share information in public security organizations' systems and it includes internetworking functionality (European Commission, 2010b). Interoperability requires co-operation, compatible systems, training co-operation, and collaborative capability.

In order to ensure effective co-operation, all stakeholders need to share visions, agree on objectives and target priorities. Actions at a cross-border level can be successful if all the Member States concerned give adequate priorities and

resources to meet their own interoperability goals in order to reach the agreed targets within the agreed timetable. The European Union (EU) share interoperability to four layers and political context as outlined in the following paragraphs.

EU describes the *political context* as follows: “The establishment of a new European public service is the result of direct or indirect action at the political level, i.e. new bilateral, multilateral or European agreements”. However, political support and assistance are needed when new services are not directly linked to new legislation, such as CISE's case, but they are created to provide better public services. Moreover, political support is necessary for cross-border interoperability efforts in order to facilitate cooperation between public administrations. (European Union, 2011.)

At the point of view of *legal interoperability*, every public administration involved in the provision of a European public service work within its own national legislation. Sometimes incompatibility of the laws of the various Member States makes it more complicated or even impossible to cooperate. When exchanging information for the provision of European public services, the legal validity of data must be maintained across borders and data protection legislation must be respected. (European Union, 2011; EUCISE, 2015c.)

The *organisational interoperability* aspect addresses cooperation between organisations, such as public administrations in different Member States, to reach their commonly agreed goals. Organisational interoperability signifies in practice the integrated business processes and related data exchange, and also tends to respond user community by making services available, easily identifiable, easy to use, and user-specific. (European Union, 2011; EUCISE, 2015c.)

*Semantic interoperability* enables organisations to process data from external sources in an appropriate manner and ensures that the precise meaning of the information exchanged is understood and maintained in the exchange between the parties. The various linguistic, cultural, legal and administrative circumstances of the Member States pose major challenges. Multilingualism in the EU adds to the complexity of the problem. (European Union, 2011; EUCISE, 2015c.)

*Technical interoperability* covers the technical aspects of the integration of information systems and includes, such as user interface specifications, interconnection services, data integration services, data presentation and information exchange. Although the public administration has its own

specific characteristics at a political, legal, organisational and semantic level, interoperability at the technical level is not particularly relevant to public administration. Therefore, technical interoperability must be ensured through official requirements and standards. (European Union, 2011; EUCISE, 2015c.)

The necessary confidence is built on a stable and long-term cooperation. A broad cooperation network can be used to develop and exploit of all partners involved in the network. Multinational cooperation develops technical and operational solutions that enable the integration of systems in different countries. The integrated security operating model provides a cross-sectoral basis for managing large-scale security threats. (Prime Minister's Office, 2017.)

## 5 DISCUSSION AND CONCLUSIONS

Broad collaboration between partners improves the Maritime Awareness and safety. Interagency cooperation is essential for the various actors in order to have sufficient knowledge of other concepts, measures, resources and plans. Interagency cooperation aims at a cost savings to increase efficiency (Tikanmäki, Tuohimaa & Ruoslahti, 2012). Good cooperation is a prerequisite for proper functioning (Taitto, 2007).

In the area of maritime surveillance, there is no inherent complexity, which is due to the fact that numerous systems are not yet interconnected and operate simultaneously. It is therefore recommended adopting common definitions for the different categories and levels of information management in the field of maritime surveillance.

Collaboration and cooperation are based on a trust in all joint operations and actions (Rajamäki and Knuuttila, 2015). Trust and knowledge sharing are identified as a key part of cross-border cooperation (Luis, Derrick, Langhals, and Nunamaker, 2013). At operative-strategic level, safety and security cooperation are based on effective cooperation between authorities and effective cooperation solutions. Participation in international cooperation and the ability to manage the domestic security contexts will support the effectiveness of cooperation. At a tactical level, a security actor is primarily required for professionalism and reliability. The most important development target for security cooperation at all levels is the ability to cooperate. Contributing factors

to the development of cooperation skills are developing cooperation processes, measurement, feedback system, and a common terminology (Valtonen, 2010).

The Internal Security authorities take advantage of new technologies and monitor actively its development. A technological development opens the means to curb the rise in costs. The authorities are required to utilize modern resources and cost-effective use. The actions of the authorities should in future be stronger than before, as well as common goals aimed for new approaches rely on pioneering. The authorities must be able to anticipate better the changes in the operating environment; operational authorities are required to act as an example in developing their own services. The aim is to develop a user-driven, together with productivity and profitability, increasing digital public services and policies. The government requires in its report a modern and cost-effective use of resources from internal security authorities. (Ministry of the Interior, 2016).

A response to security challenges and improving safety requires the cooperation of all administrative sectors, other actors, and close interaction. The action of authorities needs to be more strongly aimed at common goals. Authorities will contribute to a stronger position to act together culture and a strong commitment to common goals. The challenges are not solvable by a single administrative sector or a single actor alone posed by the complex global environment. Cooperation insists deep and committed cooperation between the various authorities and numerous other actors. Technical infrastructure, data networks and systems are closely linked.

Changes in the mind-set and breach of geographical and operational obstacles are the prerequisites for cooperation on the marine environment. Enhancing the understanding of the various sectors of the horizontal exchange of information will remove one of the obstacles. The challenge of sharing information is not the technology, but trust and ownership of information.

Researchers further research concentrates in the area of semantic interoperability in the organisation and individual point of view; how individuals from different authorities and organisations understand semantic interoperability and how to improve it? Another point of interest is validation process; how to validate the European Union funded projects' processes and what kind of framework should it be?

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